

TANTALUM CAPACITIVE MICROELECTRODE ARRAY FOR A NEURAL PROSTHESIS

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Implantable microelectronic devices for neural prosthesis require stimulation electrodes have minimal electrochemical damage to tissue or nerve from chronic stimulation.

Electrodes which have a dielectric film such as TiO_2 , Ta_2O_5 and BaTiO_3 are the most extensively studied material for capacitive stimulation electrodes [1-4]. Among them, anodically formed Tantalum Pentoxide appears the best dielectric material to use for stimulation in biological media [3].

In this work, Tantalum capacitive microelectrode arrays made of new higher density powders were further evaluated using various electrochemical techniques, such as cyclic voltammetry, electrochemical impedance spectroscopy and pulse stimulation. The Ta surface is anodized to form a layer of Tantalum Pentoxide (Ta_2O_5). The electrode properties at higher forming potential were investigated. The frequency dependence of C_{dl} is determined[5]. The methods to determine double layer capacitance of electrodes are compared.

The injectable charge density of Ta_2O_5 is smaller than those of Faradaic electrodes. However, its good surface layer stability and capacitive charge injection mechanism are advantages for chronic stimulation applications.

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